

SAE-AMS6360**ADOPTION NOTICE**

SAE-AMS6360, "Steel Tubing, Seamless 0.95Cr - 0.20Mo (0.28 - 0.33C) (SAE 4130) Normalized or Stress Relieved", was adopted on 13-JAN-95 for use by the Department of Defense (DoD). Proposed changes by DoD activities must be submitted to the DoD Adopting Activity: ASC/ENOSD, Building 125, 2335 Seventh Street, Suite 6, Wright-Patterson AFB, OH 45433-7809. DoD activities may obtain copies of this standard from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094. The private sector and other Government agencies may purchase copies from the Society of Automotive Engineers Inc., 400 Commonwealth Drive, Warrendale, PA 15096-0001.

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AEROSPACE MATERIAL SPECIFICATION

Submitted for recognition as an American National Standard

SAE AMS-6360

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Superseding AMS-6360H

STEEL TUBING, SEAMLESS
0.95Cr - 0.20Mo (0.28 - 0.33C) (SAE 4130)
Normalized or Stress Relieved

UNS G41300

1. SCOPE:

1.1 Form: This specification covers an aircraft-quality, low-alloy steel in the form of seamless tubing.

1.2 Application: Primarily for use in thin wall-thickness sections where minimum tensile strength up to 160,000 psi (1103 MPa) is required and where parts may be welded during fabrication.

2. APPLICABLE DOCUMENTS: The following publications form a part of this specification to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of other publications shall be the issue in effect on the date of the purchase order.

2.1 SAE Publications: Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

2.1.1 Aerospace Material Specifications:

AMS-2253 - Tolerances, Carbon and Alloy Steel Tubing

MAM-2253 - Tolerances, Metric, Carbon and Alloy Steel Tubing

AMS-2259 - Chemical Check Analysis Limits, Wrought Low-Alloy and Carbon Steels

AMS-2301 - Aircraft Quality Steel Cleanliness, Magnetic Particle Inspection Procedure

AMS-2370 - Quality Assurance Sampling of Carbon and Low-Alloy Steels, Wrought Products Except Forgings and Forging Stock

AMS-2640 - Magnetic Particle Inspection

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- 2.2 ASTM Publications: Available from ASTM, 1916 Race Street, Philadelphia, PA 19103-1187.

ASTM A 370 - Mechanical Testing of Steel Products

ASTM E 112 - Determining Average Grain Size

ASTM E 350 - Chemical Analysis of Carbon Steel, Low-Alloy Steel, Silicon Electrical Steel, Ingot Iron, and Wrought Iron

- 2.3 U.S. Government Publications: Available from Standardization Documents Order Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.

- 2.3.1 Military Standards:

MIL-STD-163 - Steel Mill Products, Preparation for Shipment and Storage

3. TECHNICAL REQUIREMENTS:

- 3.1 Composition: Shall conform to the following percentages by weight, determined by wet chemical methods in accordance with ASTM E 350, by spectrochemical methods, or by other analytical methods acceptable to purchaser:

| | min | max |
|------------|------|-------|
| Carbon | 0.28 | 0.33 |
| Manganese | 0.40 | 0.60 |
| Silicon | 0.15 | 0.35 |
| Phosphorus | -- | 0.025 |
| Sulfur | -- | 0.025 |
| Chromium | 0.80 | 1.10 |
| Molybdenum | 0.15 | 0.25 |
| Nickel | -- | 0.25 |
| Copper | -- | 0.35 |

- 3.1.1 Check Analysis: Composition variations shall meet the applicable requirements of AMS-2259.

- 3.2 Condition: Cold finished and either normalized and tempered, stress relieved, or otherwise heat treated.

- 3.3 Properties: Tubing shall conform to the following requirements; hardness and tensile testing shall be performed in accordance with ASTM A 370:



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3.3.1 Tensile Properties: Shall be as specified in Table I.

TABLE I

| Nominal OD Inch | Nominal Wall Thickness Inch | Tensile Strength psi, min | Yield Strength at 0.2% Offset psi, min | Elongation in 2 Inches %, min |
|--------------------|-----------------------------------|---------------------------------|--|-------------------------------------|
| Up to 0.500, excl | Up to 0.188, incl | 95,000 | 75,000 | 10 |
| Up to 0.500, excl | Over 0.188 | 90,000 | 70,000 | 10 |
| 0.500 and over | Up to 0.188, incl | 95,000 | 75,000 | 12 |
| 0.500 and over | Over 0.188 | 90,000 | 70,000 | 15 |
| | | | | 10 |

TABLE I (SI)

| Nominal OD Millimetres | Nominal Wall Thickness Millimetres | Tensile Strength MPa, min | Yield Strength at 0.2% Offset MPa, min | Elongation in 50.8 mm %, min |
|---------------------------|--|---------------------------------|--|------------------------------------|
| Up to 12.70, excl | Up to 4.78, incl | 655 | 517 | 10 |
| Up to 12.70, excl | Over 4.78 | 621 | 483 | 10 |
| 12.70 and over | Up to 4.78, incl | 655 | 517 | 12 |
| 12.70 and over | Over 4.78 | 621 | 483 | 15 |
| | | | | 10 |

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3.3.2 Grain Size: Predominantly 5 or finer with occasional grains as large as 3 permissible, determined in accordance with ASTM E 112.

3.3.3 Decarburization:

3.3.3.1 Tubing ordered ground, turned, or polished shall be free from decarburization on the ground, turned, or polished surfaces. Decarburization on tubing ID shall not exceed the maximum depth specified in Table II.

3.3.3.2 Allowable decarburization of pierced billets, of tubing for redrawing, or of tubing ordered to specified microstructural requirements shall be as agreed upon by purchaser and vendor.

3.3.3.3 Tubing to which 3.3.3.1 or 3.3.3.2 is not applicable shall be free from complete decarburization. Partial decarburization shall not exceed the limits specified in Table II.

TABLE II

| Nominal Wall Thickness (T) Inch | Depth of Partial Decarburization, Inch | | |
|------------------------------------|--|-------|---------|
| | ID | OD | ID + OD |
| Up to 0.040, incl | 0.18T | 0.18T | 0.25T |
| Over 0.040 to 0.050, incl | 0.009 | 0.009 | 0.012 |
| Over 0.050 to 0.070, incl | 0.010 | 0.010 | 0.014 |
| Over 0.070 to 0.080, incl | 0.012 | 0.012 | 0.016 |
| Over 0.080 to 0.090, incl | 0.014 | 0.014 | 0.018 |
| Over 0.090 to 0.100, incl | 0.015 | 0.015 | 0.020 |
| Over 0.100 to 0.150, incl | 0.017 | 0.017 | 0.022 |
| Over 0.150 to 0.200, incl | 0.020 | 0.020 | 0.026 |

TABLE II (SI)

| Nominal Wall Thickness (T) Millimetres | Depth of Partial Decarburization Millimetre | | |
|---|--|-------|---------|
| | ID | OD | ID + OD |
| Up to 1.02, incl | 0.18T | 0.18T | 0.25T |
| Over 1.02 to 1.27, incl | 0.23 | 0.23 | 0.30 |
| Over 1.27 to 1.78, incl | 0.25 | 0.25 | 0.36 |
| Over 1.78 to 2.03, incl | 0.30 | 0.30 | 0.41 |
| Over 2.03 to 2.29, incl | 0.36 | 0.36 | 0.46 |
| Over 2.29 to 2.54, incl | 0.38 | 0.38 | 0.51 |
| Over 2.54 to 3.81, incl | 0.43 | 0.43 | 0.56 |
| Over 3.81 to 5.08, incl | 0.51 | 0.51 | 0.66 |

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3.3.3.3.1 Limits for depth of partial decarburization of tubing having nominal wall thickness over 0.200 inch (5.08 mm) shall be as agreed upon by purchaser and vendor.

3.3.3.4 Decarburization shall be measured by the microscopic method or by Rockwell Superficial 30-N scale or equivalent hardness testing method on hardened but untempered specimens protected during heat treatment to prevent changes in surface carbon content. Depth of decarburization, when measured by a hardness method, is defined as the perpendicular distance from the surface to the depth under that surface below which there is no further increase in hardness. Such measurements shall be far enough away from any adjacent surface to be uninfluenced by any decarburization or lack of decarburization thereon.

3.3.3.4.1 When determining the depth of decarburization, it is permissible to disregard local areas provided the decarburization of such areas does not exceed the above limits by more than 0.005 inch (0.13 mm) and the width is 0.065 inch (1.65 mm) or less.

3.4 Quality:

3.4.1 Steel shall be aircraft quality conforming to AMS-2301.

3.4.2 Tubing, as received by purchaser, shall be uniform in quality and condition and shall have a finish conforming to the best practice for high quality aircraft tubing. It shall be smooth and free from heavy scale or oxide, burrs, seams, tears, grooves, laminations, slivers, pits, and other imperfections detrimental to usage of the tubing. Surface imperfections such as handling marks, straightening marks, light mandrel and die marks, shallow pits, and scale pattern will not be considered injurious if the imperfections are removable within the tolerances specified for wall thickness but removal of such imperfections is not required.

3.4.2.1 When specified, the tubing, either with or without machining of the surface, shall be subjected to magnetic particle inspection in accordance with AMS-2640. Standards for acceptance shall be as agreed upon by purchaser and vendor.

3.5 Sizes: Except when exact lengths or multiples of exact lengths are ordered, straight tubing will be acceptable in mill lengths of 6 - 20 feet (1.8 - 6.1 m) but not more than 10% of any shipment shall be supplied in lengths shorter than 10 feet (3 m).

3.6 Tolerances: Shall conform to all applicable requirements of AMS-2253 or MAM-2253.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection: The vendor of tubing shall supply all samples for vendor's tests and shall be responsible for performing all required tests. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that the tubing conforms to the requirements of this specification.